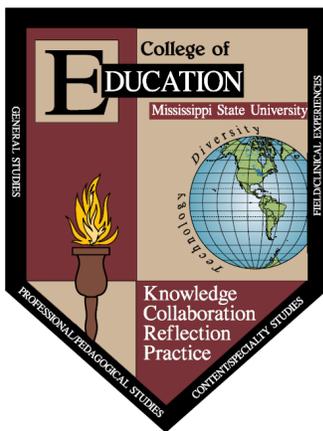


**MISSISSIPPI STATE UNIVERSITY
COLLEGE OF EDUCATION**

**DEPARTMENT of KINESIOLOGY
COURSE SYLLABUS**

Course Prefix & Number:	EP 4703
Course Title:	Neural Control of Human Movement
Credit Hours:	Three (3) semester hours
Course Type:	Lecture
Catalog Description:	Overview of the neural processes associated with human movement with the major focus being the mechanistic control of coordinated movement.

College of Education Conceptual Framework:



The faculty in the College of Education at Mississippi State University are committed to assuring the success of students and graduates by providing superior learning opportunities that are continually improved as society, schools, and technology change. The organizing theme for the conceptual framework for the College of Education at Mississippi State University is educational professionals - dedicated to continual improvement of all students' educational experiences. The beliefs that guide program development are as follows:

1. **KNOWLEDGE** - Educational professionals must have a deep understanding of the organizing concepts, processes, and attitudes that comprise their chosen disciplinary knowledge base, the pedagogical knowledge base, and the pedagogical content knowledge base. They must also know how to complement these knowledge bases with the appropriate use of technology.
2. **COLLABORATION** - Educational professionals must continually seek opportunities to work together, learn from one another, forge partnerships, and assume positions of responsibility.
3. **REFLECTION** - Educational professionals must be willing to assess their own strengths and weaknesses through reflection. They must also possess the skills, behaviors, and attitudes necessary to learn, change, and grow as life-long learners.
4. **PRACTICE** - Educational professionals must have a rich repertoire of research-based strategies for instruction, assessment, and the use of technologies. They must be able to focus

that array of skills on promoting authentic learning by all students or clients, while exhibiting an appreciation and commitment to the value and role of diversity.

Description: Neural Control of Human Movement

This course will present an overview of Human Movement and the neural processes associated with movement. The major focus of this course will be presenting the mechanistic processes behind control of coordinated movement. This course will cover topics that include the theoretical models of motor control and the structure and function of the peripheral nervous system, relationship and communication. Selected topics will be discussed in greater detail because of their significance and/or empirical basis.

Course Objectives:

- 1) To gain an understanding of neural control of human movement. CFPO #3
- 2) To learn how the neuromuscular system controls coordinated movement. CFPO #3
- 3) To learn how research is used to enhance the understanding of the motor system and its components. CFPO #3
- 4) To gain a basic understanding about various neurological diseases and disorder. CFPO #3
- 5) To gain an understanding of professional issues and be able to interpret professional presentation of these issues. CFPO #3

Topics to be Covered:

I. Cells (10 hours)

- a. Membranes, particles, and potentials
- b. Action potentials
- c. Information transmission
- d. Skeletal muscle
- e. Neural Receptors

II. Connections (10 hours)

- a. Excitation and Inhibition within the spinal cord
- b. Reflexes (monosynaptic, oligosynaptic, polysynaptic)
- c. Voluntary control of a single muscle
- d. Single Joint movement
- e. Pre-programmed reactions

III. Structures (10 hours)

- a. Brain anatomy
- b. Cerebral cortex
- c. Cerebellum
- d. Basal Ganglia
- e. Ascending and Descending pathways

IV. Control and Coordination (10 hours)

- a. Motor control
- b. Motor synergies
- c. Postural control
- d. Locomotion
- e. Multi-Joint movement and prehension
- f. Kinesthesia and Vision

V. Behavior and Disorder (5 hours)

- a. Typical and Atypical Development
- b. Peripheral Muscular and Neurological Disorders
- c. Spinal Cord Injury and Spasticity
- d. Basal Ganglia and Cerebellar Disorders
- e. Cortical Disorders
- f. Motor Rehabilitation

Required Text:

Latash, M.L. (2008). *Neurophysiological basis of movement*, 2nd Edition. Human Kinetics.

Methods of Instruction:

1. Lecture (Objectives 1-5)
2. Class Discussion (Objectives 1-5)
3. Small group activities (Objectives 1-5)

Suggested Student Activities:

1. be prepared to discuss the material from previous lectures and the textbook (Objectives 1-5).
2. participate in classroom discussion of topic (Objectives 1-5).
3. Be able to apply the material to situations you encounter as a kinesiology or health care professional (Objectives 1-5).

4. Keep up to date with all lectures and classroom presentations. If you are struggling with the material, please discuss this with the professor as soon as possible (Objectives 1-5).

Honor Code:

Mississippi State University has an approved Honor Code that applies to all students. The code is as follows:

"As a Mississippi State University student I will conduct myself with honor and integrity at all times. I will not lie, cheat, or steal, nor will I accept the actions of those who do."

Upon accepting admission to Mississippi State University, a student immediately assumes a commitment to uphold the Honor Code, to accept responsibility for learning, and to follow the philosophy and rules of the Honor Code. Students will be required to state their commitment on examinations, research papers, and other academic work. Ignorance of the rules does not exclude any member of the MSU community from the requirements or the processes of the Honor Code. For additional information please visit: <http://www.msstate.edu/dept/audit/1207A.html>

Disability:

It is the policy of Mississippi State University to accommodate students with special needs and learning disabilities as per the MSU Student Support Services policy. Students seeking accommodations on the basis of a disability or special need must identify themselves to the Office of Student Support Services (website: <http://www.sss.msstate.edu/disabilities> to verify eligibility. Additional documentation guidelines may be obtained by contacting the Office of Student Support Services directly, or via the web at <http://www.msstate.edu/dept/audit/91130.html>. Academic accommodations and services are based upon an individual's needs. All documentation is confidential.

Technology:

Students will be exposed to current uses of technology relevant to course topics and material.

Diversity:

Students will be exposed to a diverse, tolerant, fair, and culturally appropriate learning environment.

Field Component:

There is not a field component with this course.

Evaluation of Student Progress:

Exams: There will be four exams in this class. Each of the first three section exams will be valued at 100 points. The final exam will be worth 150 points. 40-50 questions of the final exam will be exactly like the first three section exams. 25-35 questions of the final will be comprehensive of all class materials.

Students will not be allowed to make up an exam unless they notify the professor prior to the exam of any conflicts which will result in their absence during the scheduled examination period.

Group assignments: Group assignments (2-3 people) will be given periodically throughout the semester. These will generally include 5-8 questions about the material to answer and discuss with a partner. These assignments will begin at 8:00 am and end at 8:15 am. The purpose of these assignments is to encourage class participation, attendance, and active studying of the material. The group assignments will make up 10% (50 points) of your final grade. If you miss a day in which a given group assignment is assigned, you will not be allowed to make it up without a doctor's excuse. While I will not grade the assignments based strictly on correctness, I will look over them and will not give credit for poor effort or a complete lack of knowledge of the material. Also, if you arrive tardy for class and miss the assignment, you will not be allowed to make it up. If you miss a group assignment due to an illness or emergency, it is **your** responsibility to make up the assignment. DO NOT wait until the end of the semester to do this.

Grades and Grading Scale:

Total points available in this class are 500.

Grading Scale: 100% to 90% = A, 450 - 500 points
 89% to 80% = B, 400 - 449 points
 79% to 70% = C, 350 - 399 points
 69% to 60% = D, 300 - 349 points
 60% and > = F, less than 300 points

Bibliography:

Chang, C.L., Jin, Z., Chang, H.C., & Cheng, A.C. (2009). From neuromuscular activation to end point locomotion: An artificial neural network based technique for neural prostheses. *Journal of Biomechanics*, 42, 982-988.

Enoka, R.M. (1997). Neural adaptations with chronic physical activity. (1997). *Journal of Biomechanics*, 30, 447-455.

- Enoka, R.M., Baudry, S., Rudroff, T., Farina, D., Klass, M., & Duchateau, J. (2011). Unraveling the neurophysiology of muscle fatigue. *Journal of Electromyography & Kinesiology*, *21*, 208-219.
- Herter, T.M. (2009). Comparison of neural responses in primary motor cortex to transient and continuous loads during posture. *Journal of Neurophysiology*, *101*, 150-163.
- Ristanis, S., Tsepis, E., Giotis, D., Stergiou, N., Cerulli, G., & Georgoulis, A.D. (2009). Electromechanical delay of the knee flexor muscles is impaired after harvesting hamstring tendons for anterior cruciate ligament reconstruction. *American Journal of Sports Medicine*, *37*, 2179-2186.

